ZooKeys 443: 11–33 (2014)
doi: 10.3897/zookeys.443.7529
http://zookeys.pensoft.net

RESEARCH ARTICLE

A peer-reviewed open-access journal
ZooKeys
Launched to accelerate biodiversity research

A synoptic review of the genus *Thaumaspis* Bolívar (Orthoptera, Tettigoniidae, Meconematinae) with the description of a new genus and four new species

Hanqiang Wang[1], Xianwei Liu[2], Kai Li[1]

1 *School of Life Science, East China Normal University, Shanghai, 200062, China* **2** *Shanghai Entomological Museum, Chinese Academy of Science, Shanghai, 200032, China*

Corresponding author: *Kai Li* (kaili@admin.ecnu.edu.cn)

Academic editor: *David Eades* | Received 17 March 2014 | Accepted 14 August 2014 | Published 29 September 2014

http://zoobank.org/99430151-B7AF-4E37-A503-FCE38BCA9FDB

Citation: Wang H, Liu X, Li K (2014) A synoptic review of the genus *Thaumaspis* Bolívar (Orthoptera, Tettigoniidae, Meconematinae) with the description of a new genus and four new species. ZooKeys 443: 11–33. doi: 10.3897/zookeys.443.7529

Abstract

Two new species of the new genus *Athaumaspis* **gen. n.**, *Athaumaspis minutus* **sp. n.** and *Athaumaspis tibetanus* **sp. n.** from Vietnam and China are described. The subgenus *Pseudothaumaspis* of *Thaumaspis* is elevated to generic status and another two new species *Pseudothaumaspis bispinosus* **sp. n.** and *Pseudothaumaspis furcocercus* **sp. n.** are described, the remaining species of *Thaumaspis* are reviewed and keyed with the four new species.

Keywords

Orthoptera, Tettigoniidae, Meconematinae, taxonomy, *Athaumaspis*, *Thaumaspis, Pseudothaumaspis,* new species

Copyright *Hanqiang Wang et al.* This is an open access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Introduction

The genus *Thaumaspis* is recognized by their opisthognathous head, short wings, and completely membranous genitalia of male. The genus was proposed by Bolívar for *Thaumaspis trigonurus* Bolívar, 1900. *Xiphidiopsis hastaticercus* Tinkham, 1936 and *Xiphidiopsis yachowensis* Tinkham, 1944 were placed into the genus by Bey-Bienko (1957). However, Gorochov (1993) thought *X. hastaticercus* was similar to *Chandozhinskia* Gorochov, 1993 without a formal assignation. Jin and Xia (1994) listed this species in *Thaumaspis*. We examined specimens of this species found there was no difference between *Thaumaspis hastaticercus* and *Chandozhinskia bivittata* except for length of wings and presence of some stripes, so we believe *T. hastaticercus* should be included in *Chandozhinskia*, as to whether they are the same species with different wing morphs or not needs molecular evidence. *X. yachowensis* was assigned to *Neocyrtopsis* Liu & Zhang, 2007 by Wang et al. (2013). Afterwards, *Thaumaspis* was subdivided into three subgenera (Gorochov 1993, 1998) based on features of pronotum, tegmina and male genitalia: *Thaumaspis* s. str., *Isothaumaspis* Gorochov, 1993 and *Pseudothaumaspis* Gorochov, 1998. Subsequently, *Thaumaspis* (*Thaumaspis*) *henanensis* Liu & Wang, 1998 (female) and *Thaumaspis* (*Thaumaspis*) *bifurcata* Liu, Zhou & Bi, 2010 (male) were placed in *Thaumaspis* both known from singletons, but now their status seems to be short of evidence and for further study the opposite sexes are required.

Gorochov (1993, 1998) included *Thaumaspis* in tribe Meconematini, but the OSF website still grouped it in Meconematinae with another 31 genera out of three tribes. Actually, those genera that were excluded from tribe Phlugidini and Phisidini should be included in Meconematini. Tirbe Phlugidini is known for their very large compound eyes, both opened protibial tympana, rounded posterior margin of pronotum, shorter tegmina than wings (except brachypterous species), ventral spines of fore femora, and short also base inflated ovipositor; Phisidini is known for their stronger ventral spines of fore and middle femora, shield protibial tympana, truncated posterior margin of pronotum, long tegmina longer than or equal to wings (except brachypterous species), and longer ovipositor (some with denticulate margins at apical half); as for Meconematini, the key features are unarmed femora, opened protibial tympana at least on one side, rounded posterior margin of pronotum, tegmina no longer than wings (except brachypterous species), and longer ovipositor with smooth margins (sometimes with an apical hook). Thus according to generic characteristics, there is no doubt for inclusion of *Thaumaspis* in tribe Meconematini.

Thaumaspis currently contains eight species. Here we elevate the subgenus *Pseudothaumaspis* to normal rank in consideration of hypognathous head and unique ventral arms of male 10th abdominal tergite. We also describe two new species of *Pseudothaumaspis*, propose a new genus *Athaumaspis* gen. n. which includes *Thaumaspis* (*Thaumaspis*) *bifurcata* Liu, Zhou & Bi, 2010 for another two new species. Four new species are from China and Vietnam: *Athaumaspis minutus* sp. n., *Athaumaspis tibetanus* sp. n., *Pseudothaumaspis bispinosus* sp. n. and *Pseudothaumaspis furcocercus* sp. n.

Material and methods

The materials for this research were collected by us (from China) and came from the Bishop Museum (from Vietnam). Morphological structures were examined using a Leica MZ 125 and an OLYMUPS SZX 16 stereomicroscope, images were taken using a Motic Moticam Pro 252A digital imaging system, and drawings were produced by Adobe Photoshop from the digital images. All type specimens of new species are deposited in the SEM (Shanghai Entomological Museum, Chinese Academy of Science.) and the BPBM (Bernice Pauahi Bishop Museum, Hawaii).

In the specimen measurements, we measured length of body by distance between apex of fastigium verticis and posterior margin of tenth abdominal tergite, ovipositor by distance between base of subgenital plate and apex of ovipositor; pronotum, tegmina and posterfemora by distance between summit of base and apex. All length are shown in millimeter.

Systematics

Key to species of genus *Thaumaspis* Bolívar, 1900, *Athaumaspis* gen. n. and *Pseudothaumaspis* Gorochov, 1998, stat. n.

1 Head hypognathous, ovipositor short and up curve, or unknown **2**

– Head obliquely opisthognathous, ovipositor almost straight and long..... ..... ***Thaumaspis*** **Bolívar, 1900...7**

2 Pair of unique ventral arms at male 10th abdominal tergite ....***Pseudothaumaspis*** **Gorochov, 1998, stat. n....3**

– Ventral part of male 10th abdominal tergite as usual .....***Athaumaspis*** **gen. n...5**

3 Each lower lobe of hind knee with an apical spine **4**

– Spine of genicular lobe absent..... ***Pseudothaumaspis furcocercus*** **sp. n.**

4 Apex of male cerci with 3 processes; subgential plate of female transverse .... ***Pseudothaumaspis gialaiensis*** **Gorochov, 1998**

– Male cerci robust, with 2 long inner processes; female unknown .... ***Pseudothaumaspis bispinosus*** **sp. n.**

5 Pronotum of male without markings; female unknown **6**

– Body smaller, pronotum with blackish brown and yellow patches ....***Athaumaspis minutus*** **sp. n.**

6 Posterior marginal process on abdominal tergite 10 larger, cerci long ....***Athaumaspis tibetanus*** **sp. n.**

– Posterior marginal process on abdominal tergite 10 very small, cerci short and stout .....***Athaumaspis bifurcatus*** **(Liu, Zhou & Bi, 2010), comb. n.**

7 Male 10th abdominal tergite bearing a single process at hind margin; female ovipositor almost straight..... ***Thaumaspis*** **(*Thaumaspis*) Bolívar, 1900...8**

–	Male 10th abdominal tergite without processes at hind margin; female unknown ..... ***Thaumaspis* (*Isothaumaspis*) Gorochov, 1993**
	..... ***Thaumaspis* (*I.*) *forcipatus* Bolívar, 1900**
8	Female subgenital plate almost triangular **9**
–	Female subgenital plate nearly quadrate, hind margin circularly truncate; male unknown..... ***Thaumaspis*(*T.*) *longipes* Bolívar, 1900**
9	Single process of male 10th abdominal tergite triangular, apex sparsely denticulated, male cerci with distinct processes; female subgenital plate not transverse, apex sharp ..... ***Thaumaspis* (*T.*) *trigonurus* Bolívar, 1900**
–	Single process of male 10th abdominal tergite longer, separate into 2 lobes apically, male cerci without process; female subgenital plate more or less transverse, apex blunt **10**
10	Middle process of male 10th abdominal tergite rearwards produced, male cerci extremely bent inwards; female subgenital plate hardly transverse, nearly circular .....***Thaumaspis? siccifolii* (Karny, 1922)**
–	Male unknown; female subgenital plate transverse, circular or triangular..**11**
11	Fastigium of vertex conical; female subgenital plate nearly triangular.....
	..... ***Thaumaspis* (*T.*) *montanus* Bey-Bienko, 1957**
–	Fastigium of vertex cylindrical; female subgenital plate nearly circular.....
	..... ***Thaumaspis* (*T.*) *castetsi* Gorochov, 1993**

Genus *Thaumaspis* Bolívar, 1900

Thaumaspis: Bolívar 1900: 768, t. 11, figs 11a–b; Kirby 1906: 373; Caudell 1912: 2; Karny 1924: 135; Beier 1966: 280; Gorochov 1993: 261; Jin and Xia 1994: 26; Otte 1997: 97; Gorochov 1998: 114.

Type species. *Thaumaspis trigonurus* Bolívar, 1900.

Description. Body small sized. Head opisthognathous. Fastigium of vertex short without sulcus dorsally, face extremely oblique, last segment of maxillary palpi longer than the preceding. Pronotum with low lateral lobes, humeral sinus absent; auditory foramina of thorax entirely exposed. Tegmina shorter than pronotum, with the stridulating organ in male, hind wing degraded. Auditory foramina of fore tibiae opened, hind tibiae with 2 pairs of apical spurs. Male 10th abdominal tergite bearing a single process on posterior margin or absence, cerci elongate with processes, subgenital plate with short styli, genitalia entirely membranous. Female subgenital plate nearly triangular, ovipositor shorter than hind femora, ventral valve with a small apical hook.

Diagnosis. The opisthognathous head and low lateral lobes of pronotum can easily distinguished them from other genera, for now *Thaumaspis* is the only genus with opisthognathous head of tribe Meconematini.

Subgenus *Thaumaspis* Gorochov, 1993

Thaumaspis (*Thaumaspis*): Gorochov 1993: 261; Jin and Xia 1994: 26; Otte 1997: 97; Gorochov 1998: 114.

Type species. *Thaumaspis trigonurus* Bolívar, 1900.

Diagnosis. Pronotum shorter, tegmina extremely short and truncate at apex, male 10th abdominal tergite attached a single process at hind margin and female subgenital plate nearly triangular.

1. *Thaumaspis* (*Thaumaspis*) *trigonurus* Bolívar, 1900

Figs 1–6

Thaumaspis trigonurus: Bolívar 1900: figs 11, a–b; Kirby 1906: 373; Caudell 1912: 3; Beier 1966: 280.
Thaumaspis (*Thaumaspis*) *trigonurus*: Gorochov 1993: figs 169–176, 261–262; Gorochov 1998: 114.

Diagnosis. Apex of the male posterior process at 10 abdominal tergite sparsely dentate (Fig. 2). Cerci slightly curved, basal half with numerous short processes (Figs 3, 4), styli short. Female subgenital plate triangular, apex slightly sharp (Fig. 5).

Coloration. Body greenish, unicolor.

Measurement. (length in mm) Body, ♂♀9.0; pronotum, ♂♀3.8; tegmina, ♂♀0.5–1.5; hind femora, ♂♀7.0; ovipositor, ♀7.0.

Distribution. India.

2. *Thaumaspis*? *siccifolii* (Karny, 1922)

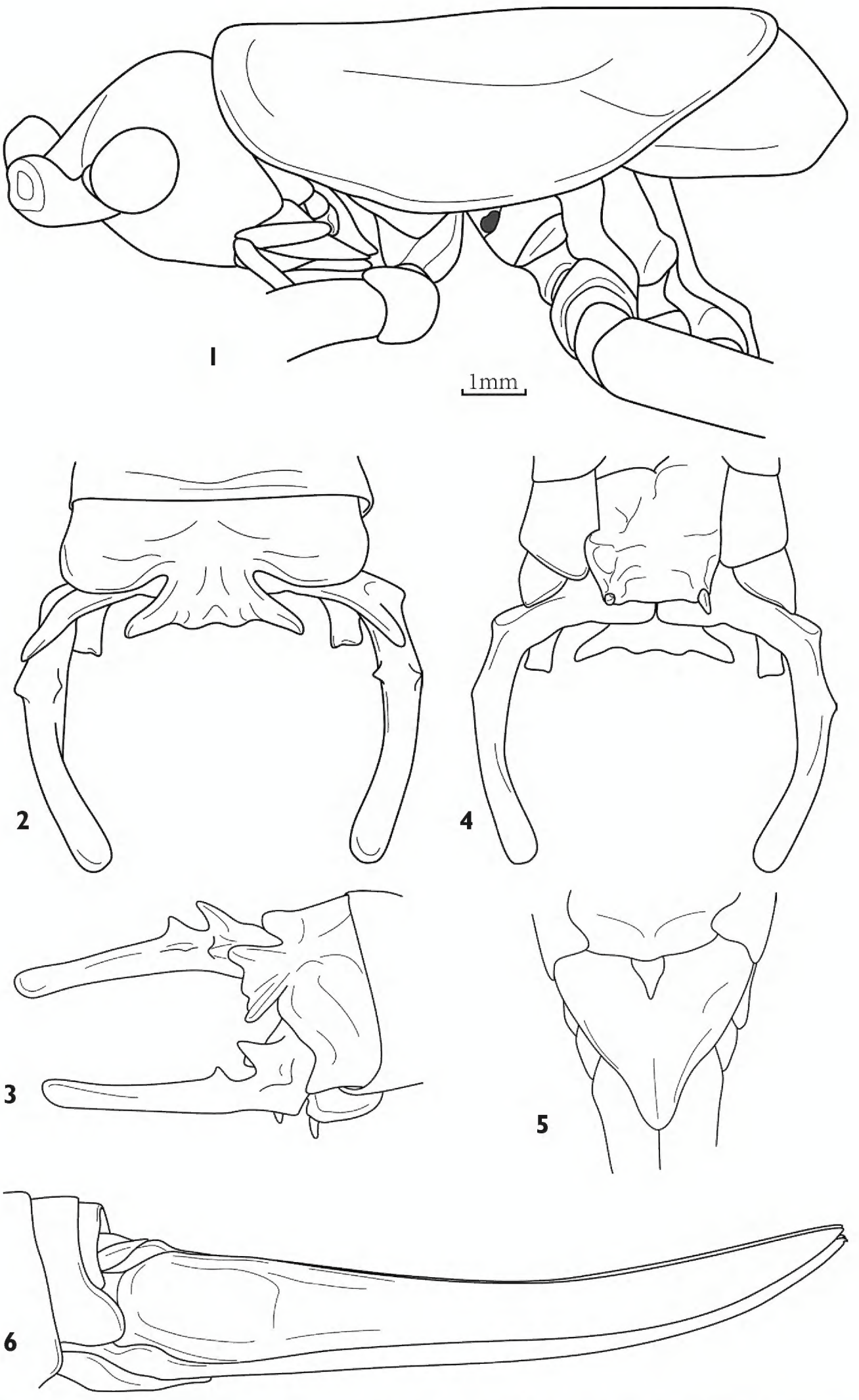
Figs 7–11

Cecidophaga siccifolii: Karny 1922: 299, fig. 3.
Thaumaspis siccifolii: Karny 1924: 135, figs 54 a–f; Beier 1966: 280.
Thaumaspis (*Thaumaspis*) *siccifolii*: Otte 1997: 98.

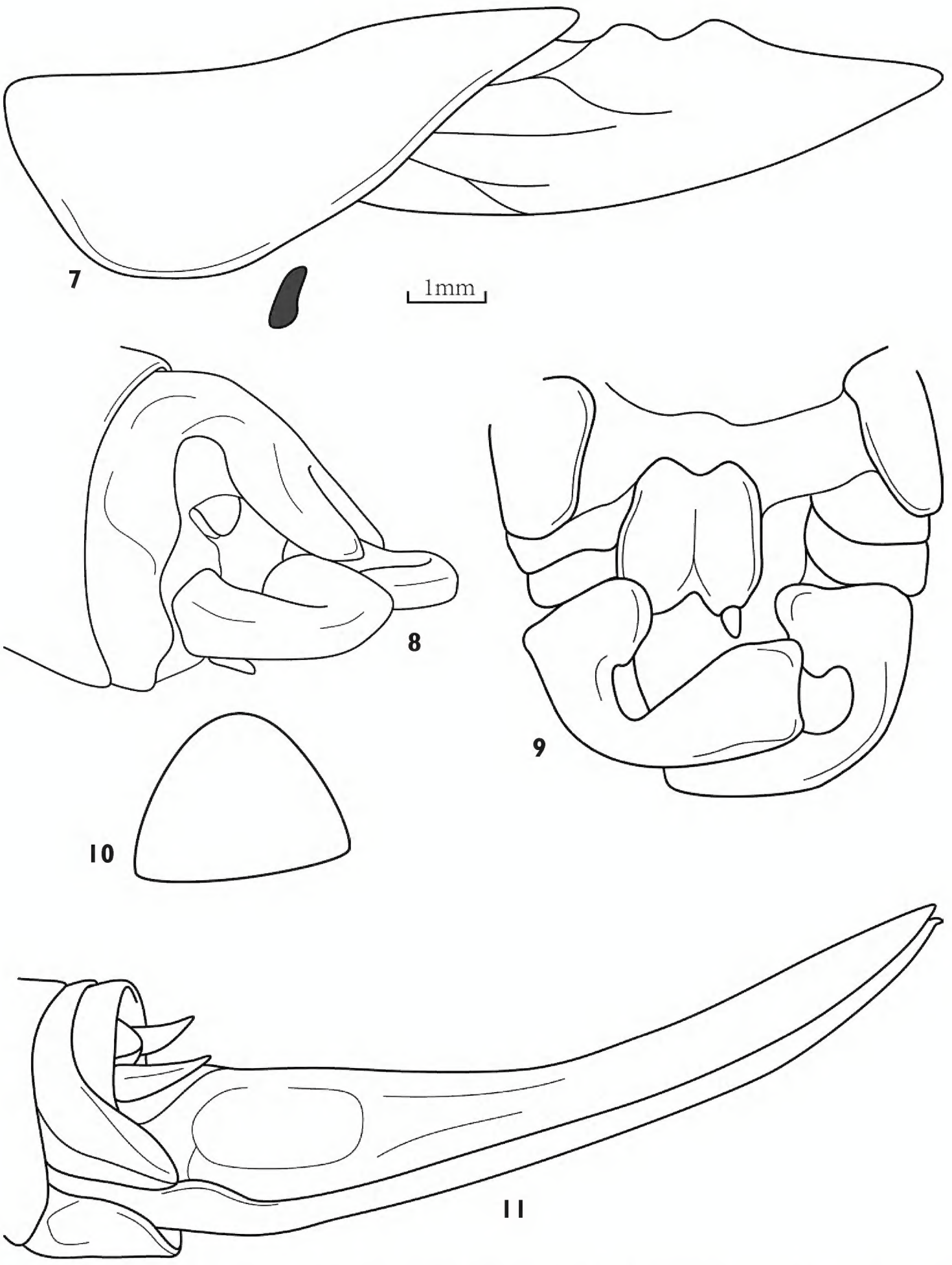
Diagnosis. Head hypognathous. Male 10th abdominal tergite transverse, middle lobe divided into 2 finger-shaped apices (Fig. 8). Cerci extremely incurved, ventral base and subapex widened (Fig. 9). Subgenital plate almost trapezoidal. Female subgenital plate almost circular (Fig. 10).

Coloration. Body olive-green, eyes darkish, antennae with dark rings.

Measurement. (length in mm) Body, ♂8.0, ♀8.5–9.5; pronotum, ♂3.0, ♀2.5; tegmina, ♂♀3.0; hind femora, ♂♀8.0–8.5; ovipositor, ♀5.5–6.0.



Figures 1–6. *Thaumaspis* (*Thaumaspis*) *trigonurus* Bolívar, 1900 (after OSF website) **1** head, pronotum and tegmina, lateral view **2**end of male abdomen, dorsal view **3** end of male abdomen, lateral view **4** end of male abdomen, ventral view **5** subgenital plate of female, ventral view **6** female abdomen terminal, lateral view.



Figures 7–11. *Thaumaspis*? *siccifolii* (Karny, 1922) (after OSF website and Karny) **7** pronotum and tegmina, lateral view **8** end of male abdomen, dorsal-lateral view **9** end of male abdomen, ventral view **10** subgenital plate of female, ventral view (after Karny) **11** female abdomen terminal, lateral view.

Discussion. The general features of this species ally to *Cecidophagula*, such as characters of head and wings. Actually, it had been described as a *Cecidophagula* originally before Karny assigned it to *Thaumaspis* in consideration of the single process of genital segments. Gorochov excluded this species in his study (1993, 1998). Since we are unable to examine type material we still leave it in *Thaumaspis*.

Distribution. Indonesia.

3. *Thaumaspis* (*Thaumaspis*) *montanus* Bey-Bienko, 1957

Figs 12–13

Thaumaspis montanus: Bey-Bienko 1957: 411, fig. 13; Bey-Bienko 1962: 135; Beier 1966: 280; Liu and Jin1994: 109; Jin and Xia1994: 26.

Thaumaspis (*Thaumaspis*) *montana*: Gorochov 1993: 82; Gorochov 1998: 114, figs 102–103.

Diagnosis. Female tegmina rather shorter than pronotum, subgenital plate short, nearly triangular, apex blunt (Fig. 13). Male unknown.

Coloration. Body yellowish (maybe greenish in life), totally unicolor.

Measurement. (length in mm) Body, ♀9.5; pronotum, ♀3.7; tegmina, ♀3.2; hind femora, ♀8.5; ovipositor, ♀7.5.

Distribution. China (Yunnan, Tengchong).

4. *Thaumaspis* (*Thaumaspis*) *castetsi* Gorochov, 1993

Figs 14–16

Thaumaspis (*Thaumaspis*) *castetsi*: Gorochov 1993: 83, figs 177–179, 263; Gorochov 1998: 114.

Diagnosis. Female subgenital plate transverse, hind margin with middle circular convex (Fig. 15). Ovipositor almost straight (Fig. 16). Male unknown.

Coloration. Body yellowish, unicolor.

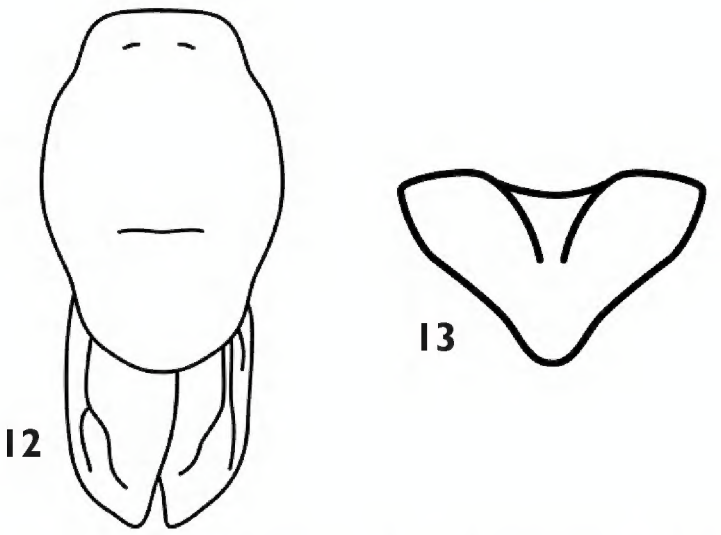
Measurement. (length in mm) Body, ♀11.0; pronotum, ♀3.7; tegmina, ♀2.4; hind femora, ♀7.5; ovipositor, ♀7.0.

Distribution. India.

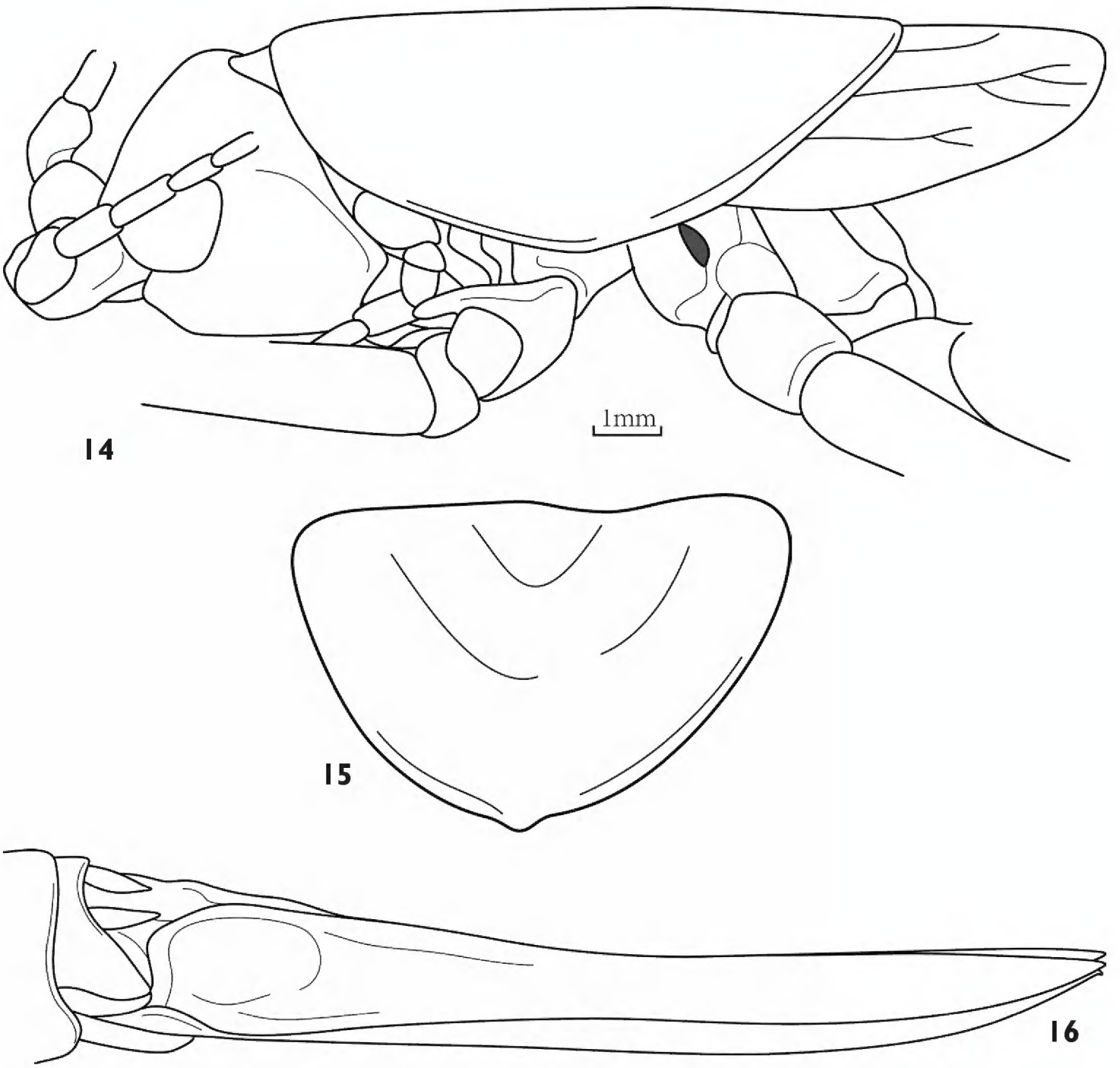
5. *Thaumaspis* (*Thaumaspis*) *longipes* Bolívar, 1900

Figs 17–19

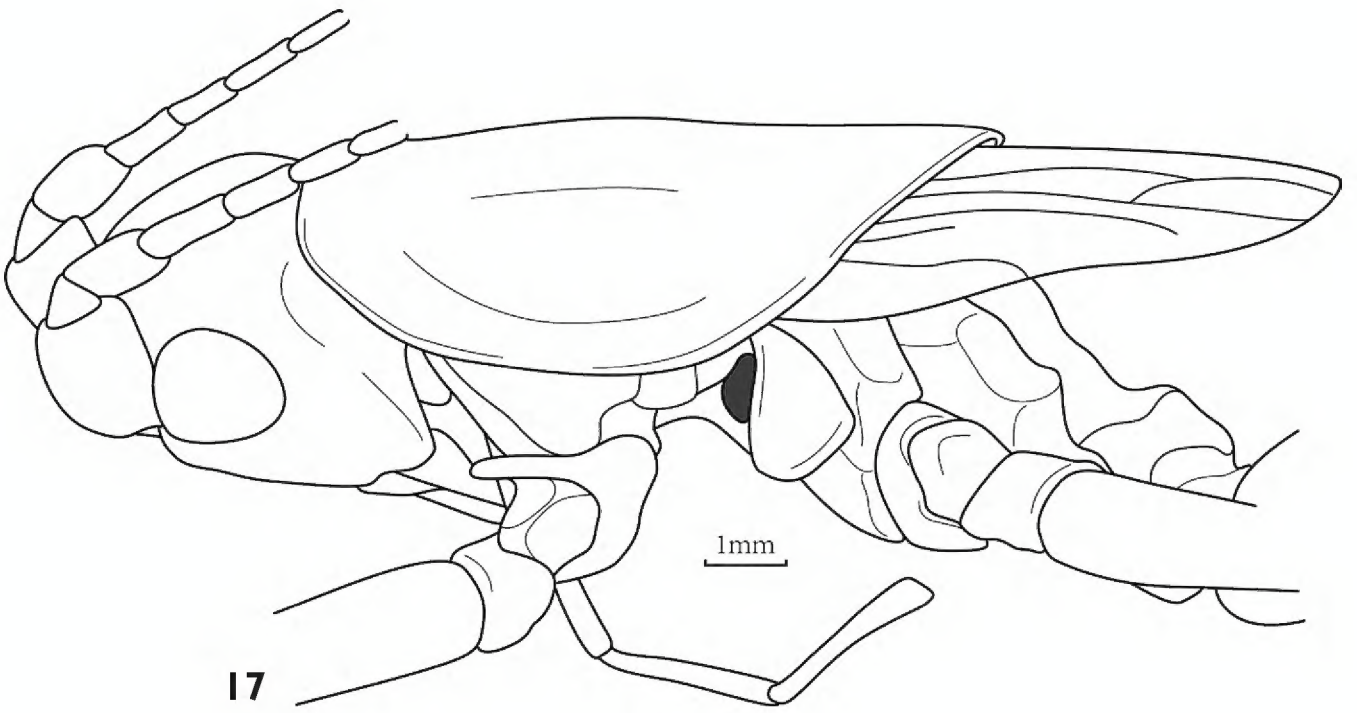
Thaumaspis longipes: Bolívar 1900: 769, t. 11, fig. 13; Kirby 1906: 373; Caudell 1912: 3; Beier 1966: 280.

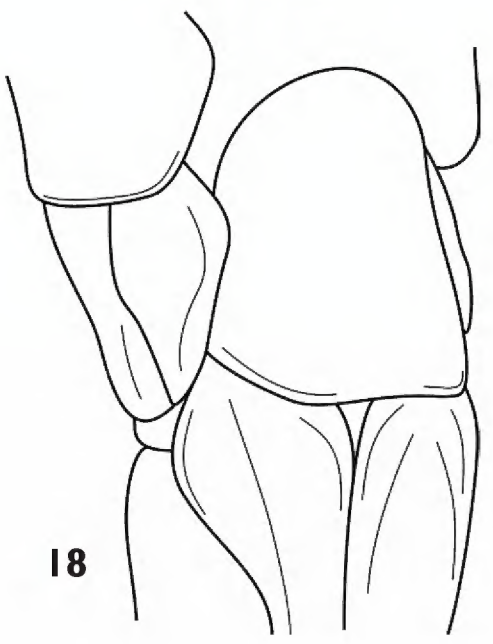


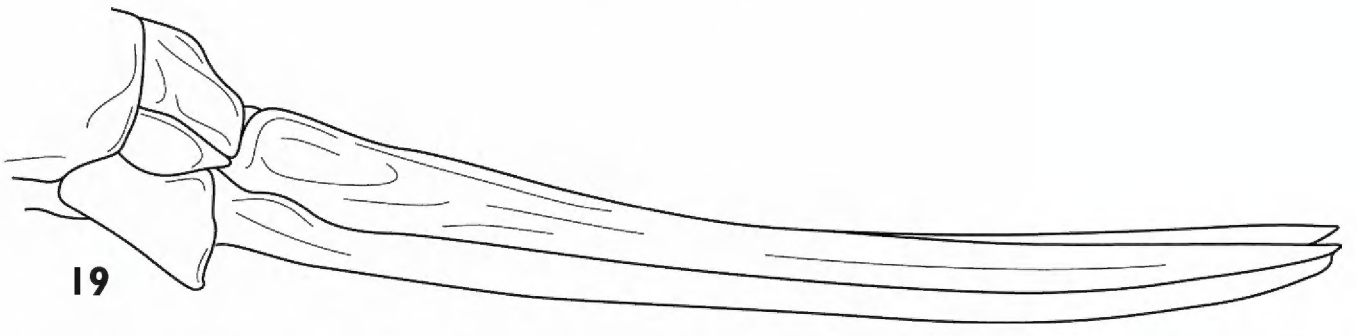
Figures 12–13. *Thaumaspis* (*Thaumaspis*) *montana* Bey-Bienko, 1957 (after Gorochov) **12** pronotum and tegmina, dorsal view **13** subgenital plate of female, ventral view.



Figures 14–16. *Thaumaspis* (*Thaumaspis*) *castetsi* Gorochov, 1993 (after OSF website) **14** head, pronotum and tegmina, lateral view **15** subgenital plate of female, ventral view **16** female abdomen terminal, lateral view.







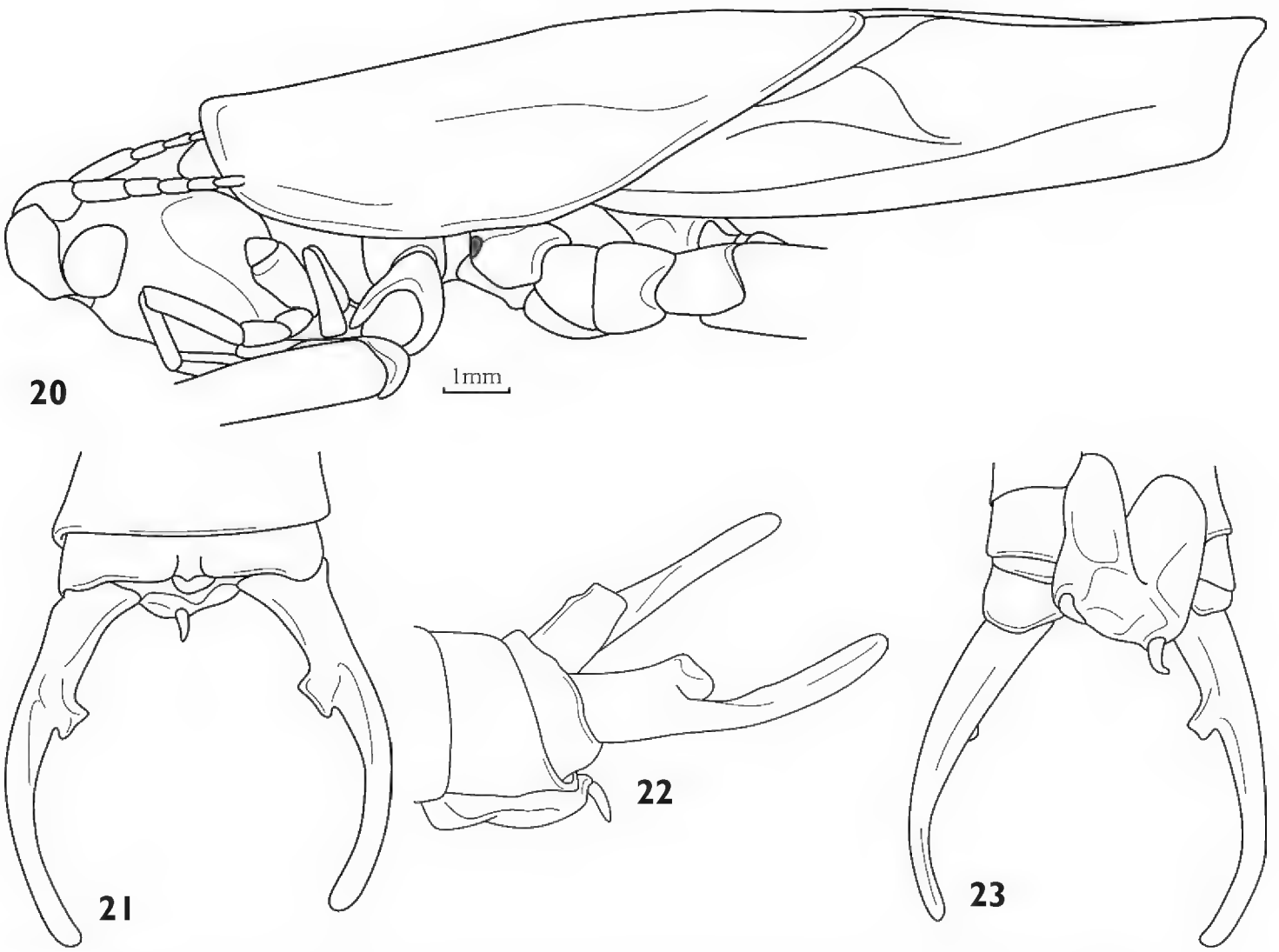
Figures 17–19. *Thaumaspis*(*Thaumaspis*) *longipes* Bolívar, 1900 (after OSF website) **17** pronotum and tegmina, lateral view **18** subgenital plate of female, ventral view **19** female abdomen terminal, lateral view.

Thaumaspis (*subgenus*?) *longipes*: Gorochov 1993: 83, figs 184–186, 265.
Thaumaspis (*Pseudothaumaspis*?) *longipes*: Gorochov 1998: 114–115.

Diagnosis. Female tegmina no longer than pronotum, apex pointed. Subgenital plate nearly quadrate, hind margin circularly truncated (Fig. 19). Male unknown.

Coloration. Body greenish, unicolor.

Measurement. (length in mm) Body, ♀12.0; pronotum, ♀3.8; tegmina, ♀3.0; hind femora, ♀10.0; ovipositor, ♀10.0.



Figures 20–23. *Thaumaspis* (*Isothaumaspis*) *forcipatus* Bolívar, 1900 (after OSF website) **20** head, pronotum and tegmina, lateral view **21** end of male abdomen, dorsal view **22** end of male abdomen, lateral view **23** end of male abdomen, ventral view.

Distribution. India (New Delhi).

Subgenus *Isothaumaspis* Gorochov, 1993

Thaumaspis (*Isothaumaspis*): Gorochov 1993: 83, figs 181–183.

Type species. *Thaumaspis forcipatus* Bolívar, 1900.

Diagnosis. This subgenus differs from nominotypical subgenus by longer pronotum equal to tegmina, posterior marginal processes of male 10th abdominal tergite absent.

6. *Thaumaspis* (*Isothaumaspis*) *forcipatus* Bolívar, 1900

Figs 20–23

Thaumaspis forcipatus: Bolívar 1900: 769, t. 11, figs 12a–b; Kirby 1906: 373; Caudell 1912: 3; Beier 1966: 280.

Thaumaspis (*Isothaumaspis*) *forcipatus*: Gorochov 1993: 83, figs 180–183, 264; Gorochov 1998: 114.

Diagnosis. Male pronotum longer, tegmina almost equal to pronotum, apex truncate (Fig. 20). 10th abdominal tergite with a median notch at middle of hind margin (Fig. 21). Cerci longer, slightly incurved, median portion with one lobe truncated in apex (Fig. 22). Female unknown.

Measurement. (length in mm) Body, ♂11.0; pronotum, ♂4.8; tegmina, ♂4.8; hind femora, ♂5.5.

Distribution. India.

Genus *Athaumaspis* Wang & Liu, gen. n.

http://zoobank.org/D0F10EB4-C1F6-440C-A6B0-6723D1BD0506

Type species. *Athaumaspis minutus* sp. n.

Description. Body small of this tribe. Head hypognathous, low in profile. Fastigium of vertex short with shallow furrow dorsally, last segment of maxillary palpi little longer than the preceding. Pronotum with lower paranota, humeral sinus absent; auditory foramina of thorax entirely exposed. Tegmina shorter than pronotum, with the stridulating organ in male, hind wing degraded. Auditory foramina of fore tibiae opened, hind tibiae with 2 pairs of apical spurs. Male 10th abdominal tergite with branched process at posterior margin, cerci elongate or branched, subgenital plate with short styli, genitalia entirely membranous. Female subgenital plate transverse, rounded at posterior margin, ovipositor short and upcurved, ventral valve with a small apical hook.

Diagnosis. This new genus similar to *Thaumaspis* in body size and bearing posterior marginal process of abdominal tergite 10, but quite different by hypognathous head, marginal process of abdominal tergite 10 bifurcated.

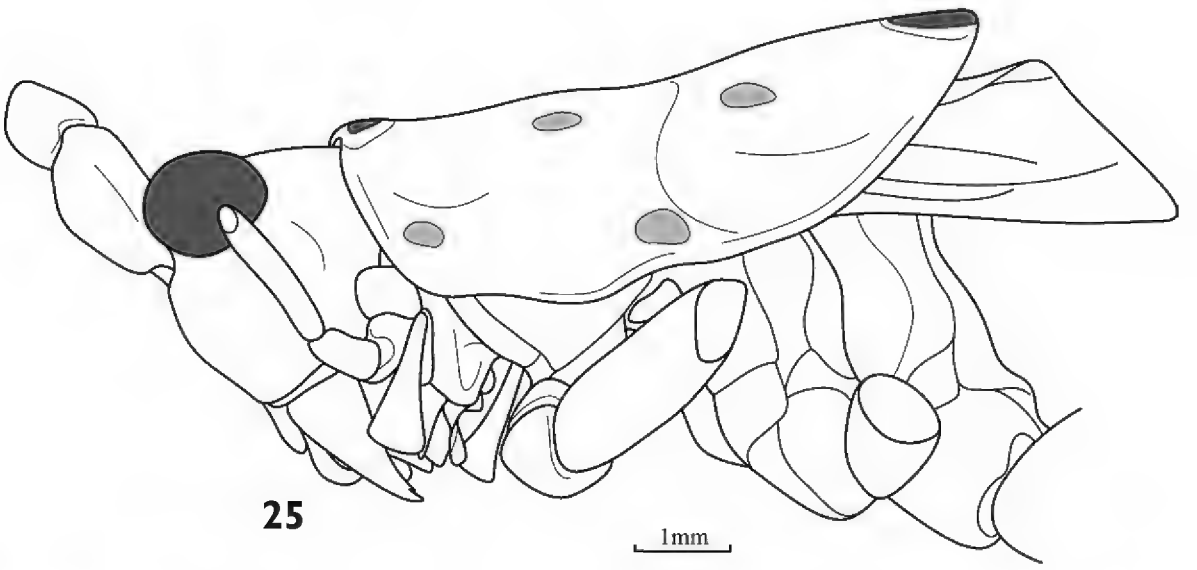
7. *Athaumaspis minutus* Wang & Liu, sp. n.

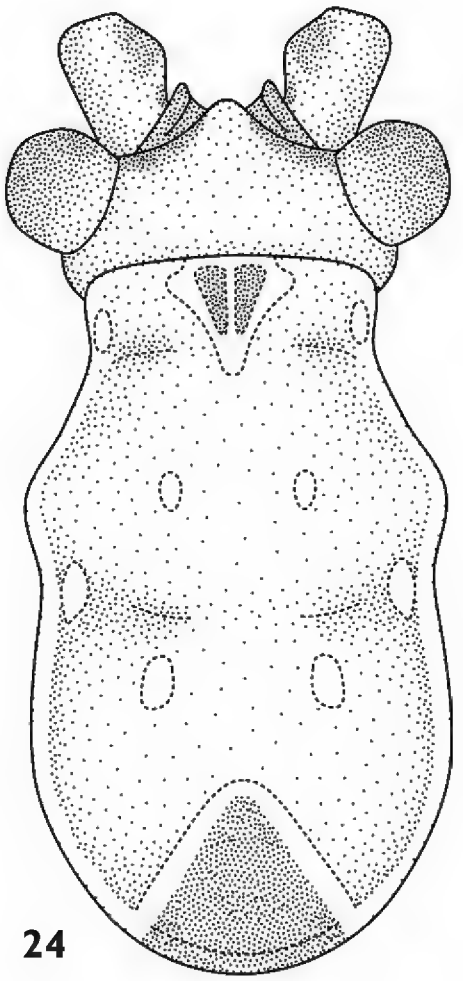
http://zoobank.org/829CEB3D-6C75-4098-8773-C9BBE472BF5C

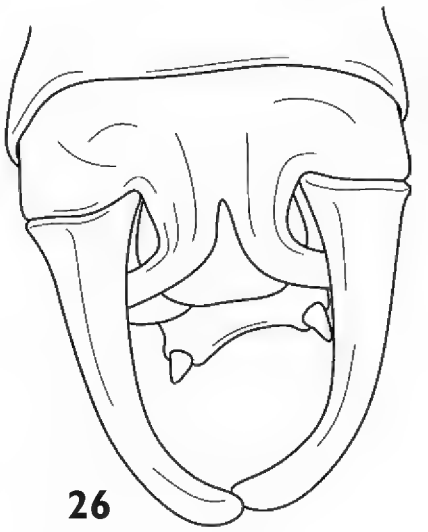
Figs 24–30

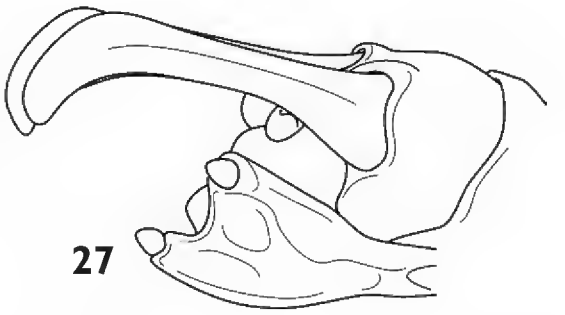
Materials. Holotype♂, paratype2♀♀, Vietnam, Mt. Lang Bian, Alt. 1500–2000m, 1961.V.19–VI.8, coll. N.R. Spencer (BPBM). Deposited in SEM temporarily.

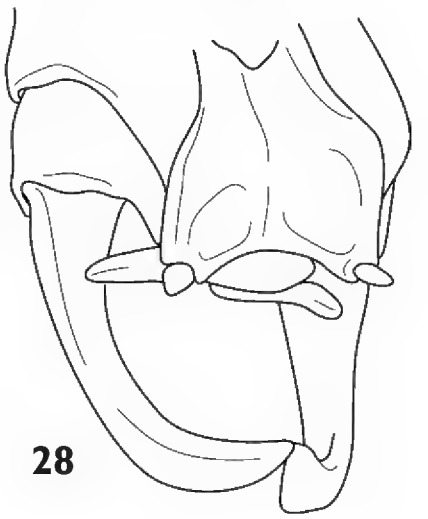
Description. Male. Head low in profile. Fastigium of vertex rather short, shallowly furrowed on dorsum (Fig. 24), face slightly oblique (Fig. 25), compound eyes oval and protruded outwards, last segment of maxillary palpi longer than preceding. The superior and inferior edge of pronotum nearly paralled from a lateral view, metazona slightly elevated, paranota of pronotum lower, hind margin rounded, humeral sinus absent; auditory foramina of thorax entirely exposed. Tegmina shorter than pronotum, hind margin obliquely truncated, hind wings reduced. Fore tibiae armed spines of type 4, 4 (1, 1) on either margin of ventral surface, hind tibiae with 20–23 dorsal teeth each margin above and 2 pairs of apical spurs. Posterior margin of abdominal tergite 10 with middle process,

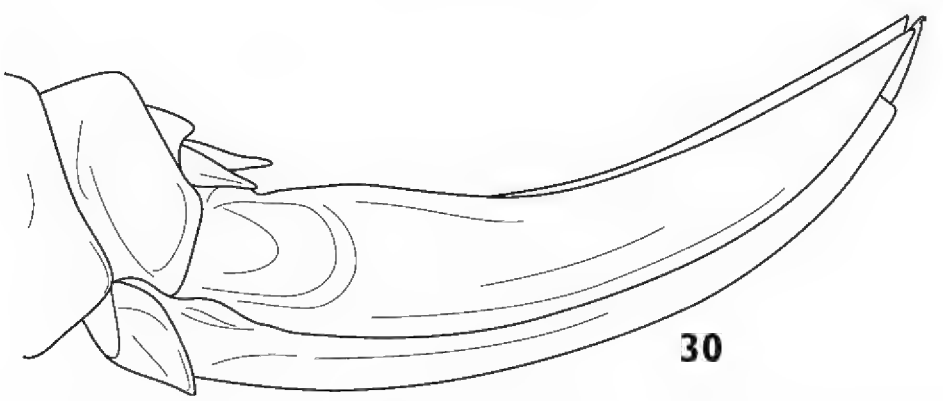












Figures 24–30. *Athaumaspis minutus* sp. n. **24** head, pronotum and tegmina, dorsal view **25** head, pronotum and tegmina, lateral view **26** end of male abdomen, dorsal view **27** end of male abdomen, lateral view **28** end of male abdomen, ventral view **29** subgenital plate of female, ventral view **30** female abdomen terminal, lateral view.

distinctly branched (Fig. 26). Epiproct reduced. Cerci elongate, rather simple, incurved in its apical third, dorsal surface with weak keels (Fig. 27). Subgenital plate narrowed basally, broad in apical half, hind margin roundly emarginate with rather short styli (Fig. 28).

Female. General roughly as in male. Cerci short and conical, subgenital plate transverse and flabellate, hind margin circular convex (Fig. 29). Ovipositor is short, upcurved, ventral valve with a weak apical hook.

Coloration. Body yellowish (maybe greenish in life), eyes blackish brown, antennae with inconspicuous darkish rings, fore and hind margins of pronotum either with blackish brown marking rounded yellow rim (Fig. 24), lateral lobe with 4 yellow markings.

Measurement. (length in mm) Body, ♂7.5, ♀8.0; pronotum, ♂2.8, ♀2.2; tegmina, ♂1.0, ♀0.8; hind femora, ♂6.5, ♀7.0; ovipositor, ♀3.8.

Diagnosis. This new species distinguishes from other species of the genus in body smaller, pronotum with blackish brown and yellow markings, female subgential plate with rounded posterior edge.

Etymology. The specific epithet referrers body form of this species, from Latin minūtus. The gender of the epithet is masculine.

Distribution. Vietnam.

8. *Athaumaspis tibetanus* Wang & Liu, sp. n.

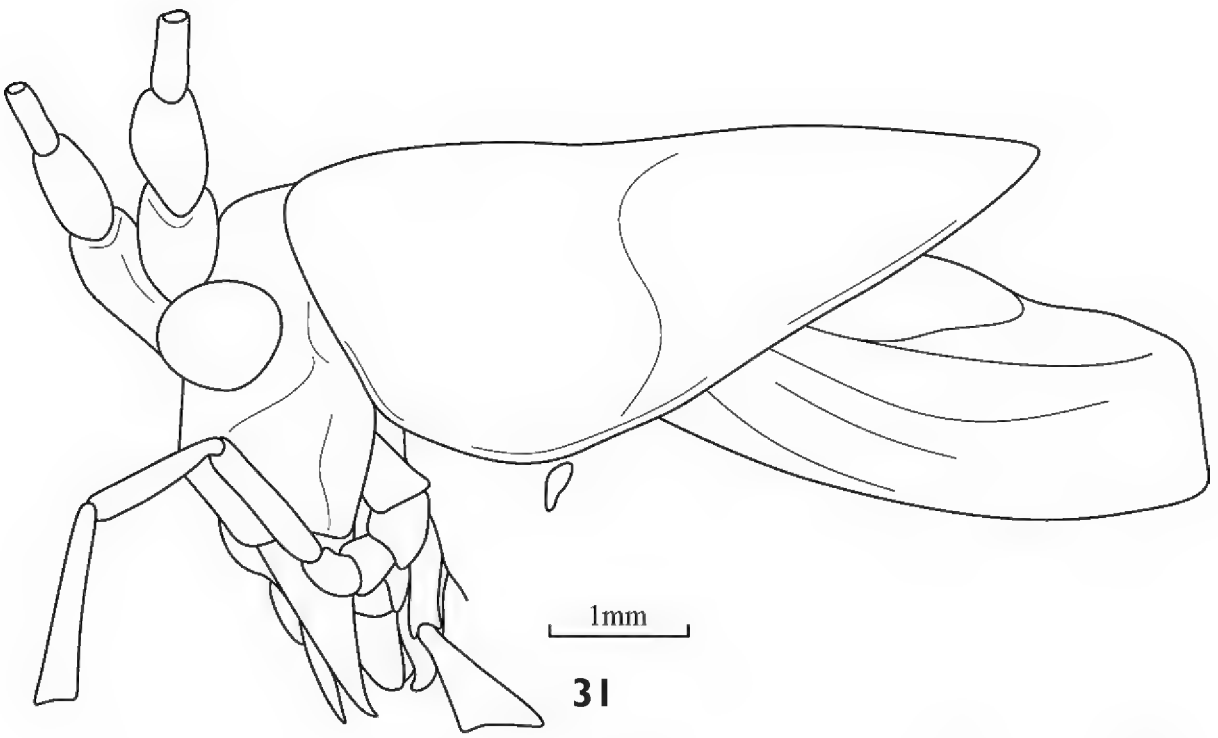
http://zoobank.org/C0DE31AE-E56B-47E3-AC1E-5141CBAB73BA
Figs 31–34

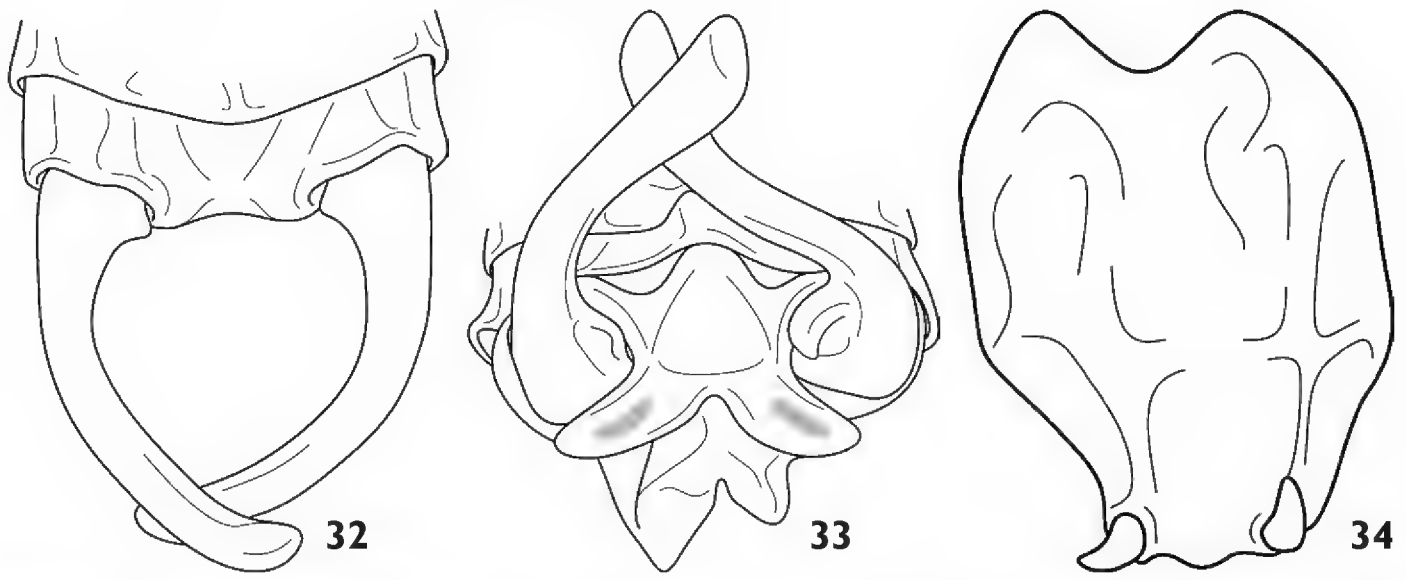
Materials. Holotype ♂ (# 14088760), China, Xizang, Nyalam Country, Zhangmu, Alt. 2300m, 2010.VII.17–18, coll. W.X. Bi; Paratype 1♂ (# 14088761), same data as holotype (SEM).

Description. Male. Head high in profile. Fastigium of vertex short, dorsum shallowly furrowed in middle, face slightly oblique (Fig. 31), but higher, compound eyes subovoid and moderately protruded, last segment of maxillary palpi slightly longer than preceding. Protonum nearly triangular in profile, metazona little elevated, paranota higher, hind margin obliquely truncated without humeral sinus; auditory foramina of thorax entirely exposed. Tegmina shorter than pronotum by one third, posterior edge truncated; hind wings deduced. Fore tibiae spines armed 4, 4 (1, 1), hind tibiae with 19–20 dorsal teeth either margin above and 2 pairs of apical spurs. 10th abdominal tergite bearing an extended process at the middle of hind margin, bending vertically downwards and invisible dorsally (Fig. 32), apex distinctly branched (Fig. 33). Epiproct reduced. Cerci longer, inner surface of base occurs a lobe, incurved in one third, apex moderately expanding. Subgenital plate longer than width, apical two fifth narrowing towards tip, little convex at median hind margin, styli short (Fig. 34).

Female unknown.

Coloration. Body yellowish (may be greenish in life), unicolor.





Figures 31–34. *Athaumaspis tibetanus* sp. n. based on # 14088761 (**31, 34**) and # 14088760 (**32, 33**) **31** head, pronotum and tegmina, lateral view **32** end of male abdomen, dorsal view **33** middle process of male 10th abdominal tergite, rear view **34** subgenital plate of male, ventral view.

Measurement. (length in mm) Body, ♂7.0–8.0; pronotum, ♂3.3–3.5; tegmina, ♂2.0; hind femora, ♂6.5–7.0.

Diagnosis. This species looks different from type species in general, distinguishes mainly by higher head and pronotum in profile and inner lobe of cerci; but shearing branched process of male 10th abdominal tergite and simple but slender cerci.

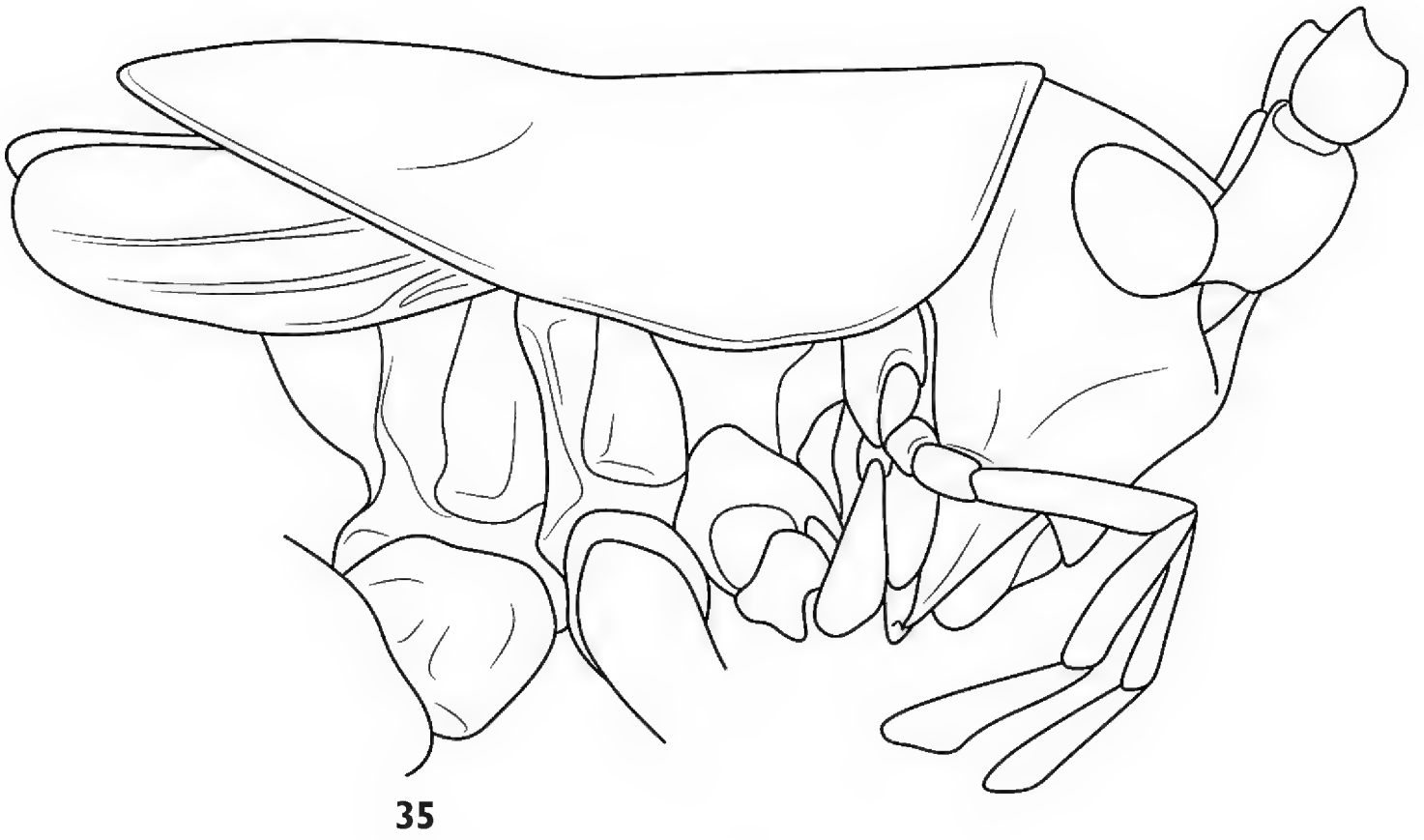
Etymology. The specific epithet is Latinized name of district Tibet where this species distributed. The gender of the epithet is masculine.

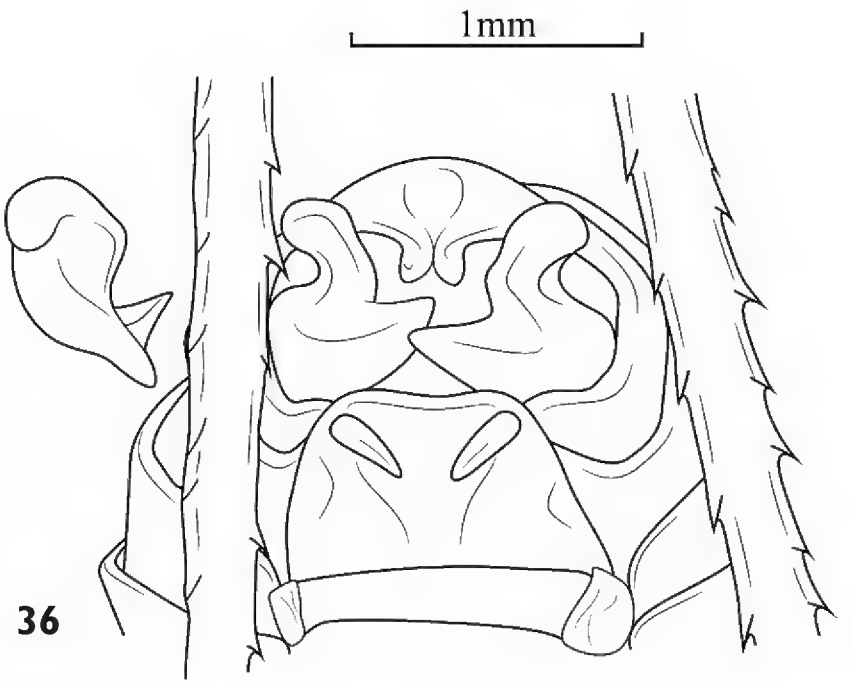
Distribution. China (Xizang).

9. *Athaumaspis bifurcatus* (Liu, Zhou & Bi, 2010), comb. n.

Figs 35–36

Thaumaspis bifurcata: Liu et al. 2010: 81.





Figures 35–36. *Athaumaspis bifurcatus* (Liu, Zhou & Bi, 2010) comb. n. **35** head, pronotum and tegmina, lateral view **36** end of male abdomen, ventral-rear view, and right cercus, dorsal view.

Diagnosis. Posterior margin of male 10th abdominal tergite with a small branched process, male cercus stout and bifurcated, superior ramus clubbed, inferior ramus with an inner triangular lobe at proximal part.

Coloration. Body yellowish green. Eyes and spines of hind tibiae blackish, genicular lobes of all femora each with a blackish spot.

Material examined. Holotype♂, paratype1♂, Daitianping, Fengyangshan National Nature Reserve, Zhejiang, Alt. 1200m, 2008.X.20, coll. S.L. Liu.

Measurement. (length in mm) Body, ♀6,5; pronotum, ♀3.5; tegmina, ♀2.0; hind femora, ♀6.5.

Discussion. The cerci of this species are stouter and quite different from previous 2 species of this genus which makes it easy to tell them apart, meanwhile the species meets the diagnosis of *Athaumaspis* in hypognathous head and bifurcated posterior marginal process of abdominal tergite 10. According to the features of male here we treat this species as an *Athaumaspis*. The specific epithet of this species originally was feminine, primarily based on Gorochov (1993), but according to type species of *Thaumaspis* the genus is masculine and 'bifurcata' should be 'bifurcatus', The same apply for *Athaumaspis* and *Pseudothaumaspis*.

Distribution. China (Zhejiang).

Genus *Pseudothaumaspis* Gorochov, 1998, stat. n.

Thaumaspis (*Pseudothaumaspis*): Gorochov 1998: 115.

Type species. *Pseudothaumaspis gialaiensis* Gorochov, 1998.

Diagnosis. This genus differs from *Thaumaspis* by hypognathous head, differs form all previous genera by unusual ventral arms at lower part of male 10th abdominal tergite, moreover posterior marginal processes of this tergite absence or instead of by small lobes, varied apex of cerci and almost trilobed posterior part of female subgenital plate. We believed hypognathous head and unique ventral arm of male 10th abdominal tergite sufficient to exclude *Pseudothaumaspis* from *Thaumaspis* and elevate it to generic status.

10. *Pseudothaumaspis gialaiensis* Gorochov, 1998

Figs 37–41

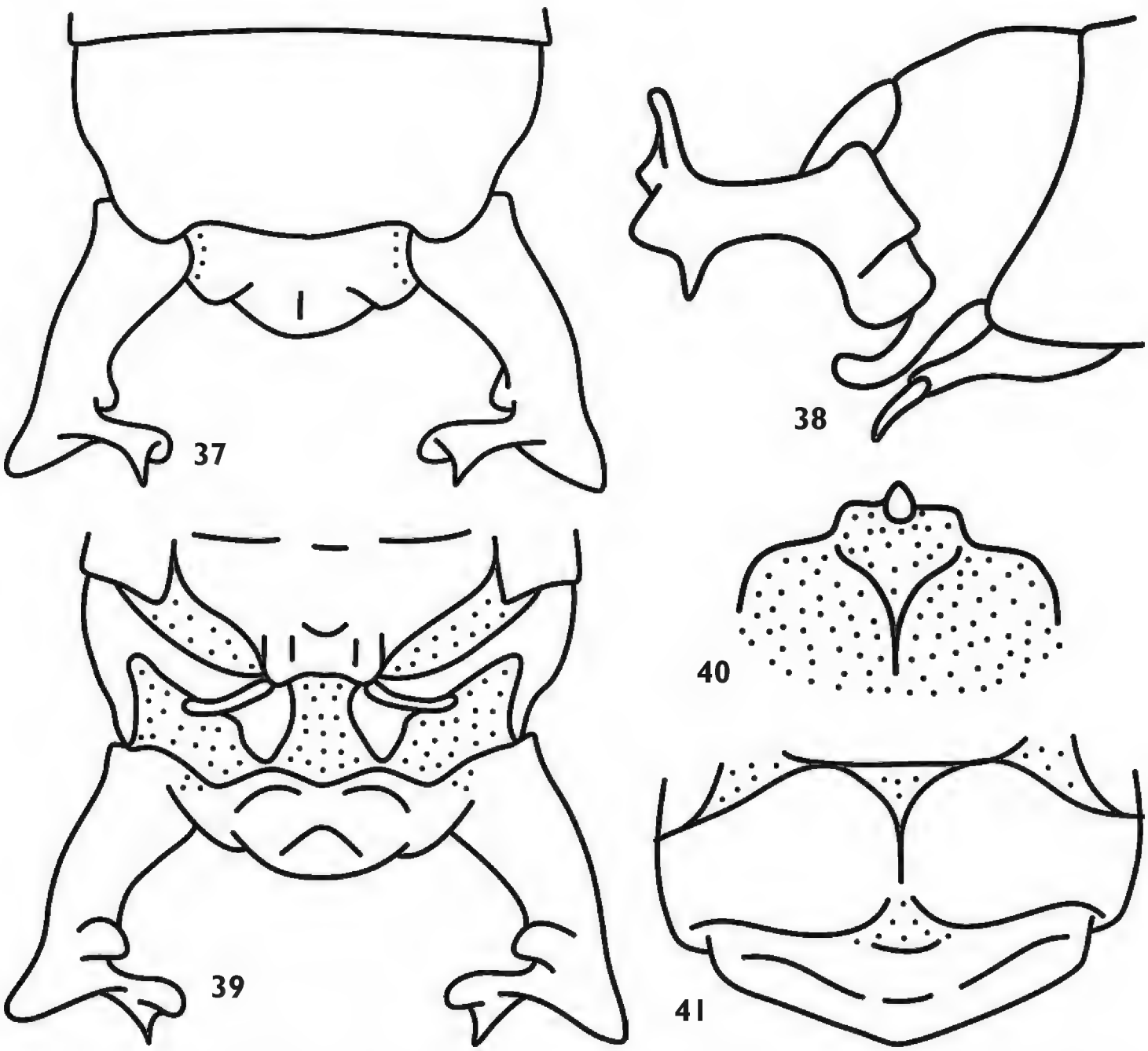
Thaumaspis (*Pseudothaumaspis*) *gialaiensis*: Gorochov 1998: 115, figs 104–109.

Diagnosis. Lower lobe of the male hind knee with spine, apex of male cerci with 3 processes (Figs 37–39), shorter subgenital plate with longer styli, genital smaller, apex with small a sclerous corium (Fig. 40). Female subgential plate transverse (Fig. 41), hind margin bent downwards; ventral valve of ovipositor with an apical hook.

Coloration. Body yellowish green, almost unicolor, antennae with brown rings, lower part of the pronotum lateral lobe with brown edge; apex of tibiae, tarsus and spine of tibiae darkened.

Measurement. (length in mm) Body, ♂13.0–14.0, ♀12.0–13.0; pronotum, ♂4.2–4.5, ♀4.0–4.2; tegmina, ♂4.0–4.5, ♀3.0; hind femora, ♂13.5–14.0, ♀14.0–15.0; ovipositor, ♀5.8–6.0.

Distribution. Vietnam.



Figures 37–41. *Pseudothaumaspis gialaiensis* Gorochov, 1998 (after Gorochov) **37** end of male abdomen, dorsal view **38** end of male abdomen, lateral view **39** end of male abdomen, ventral view **40** male genitals, dorsal view **41** subgenital plate of female, ventral view.

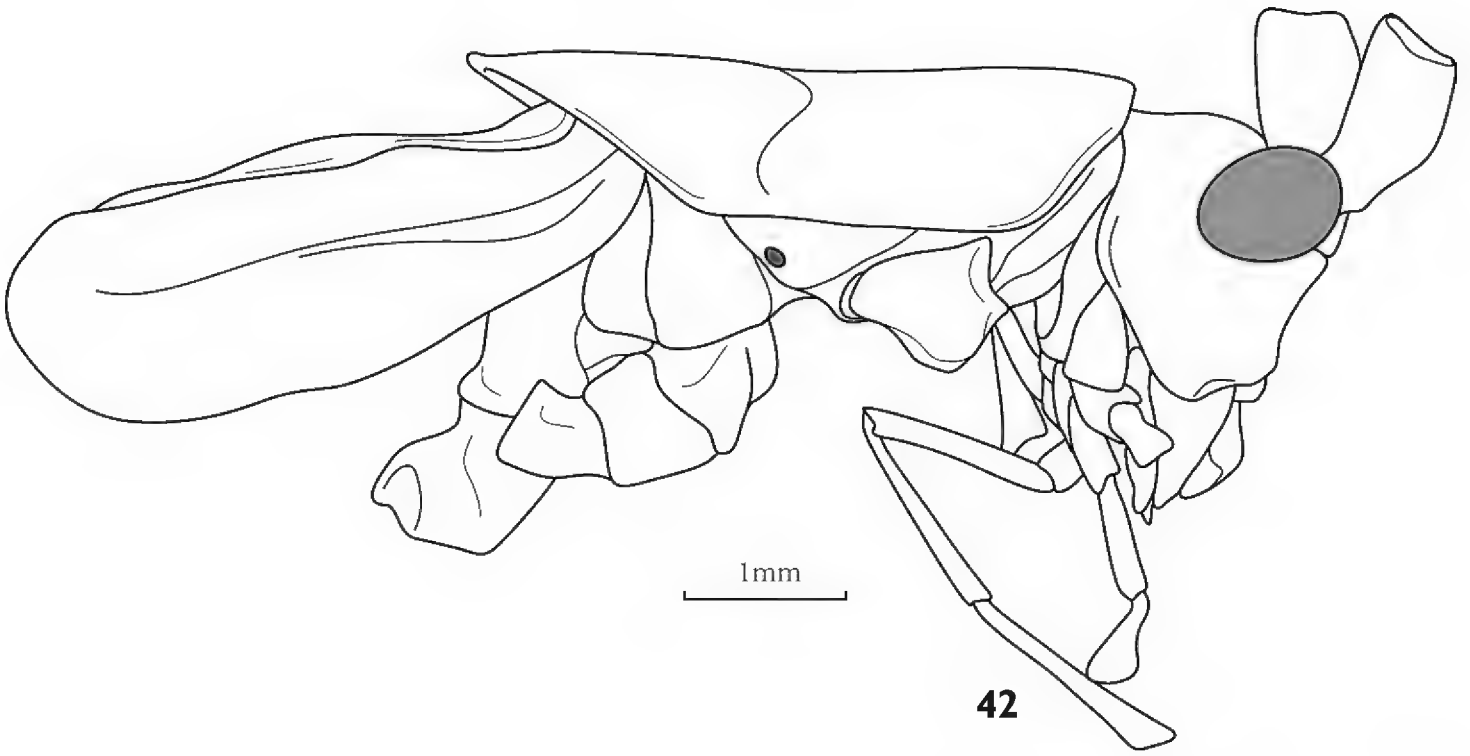
11. *Pseudothaumaspis bispinosus* Wang & Liu, sp. n.

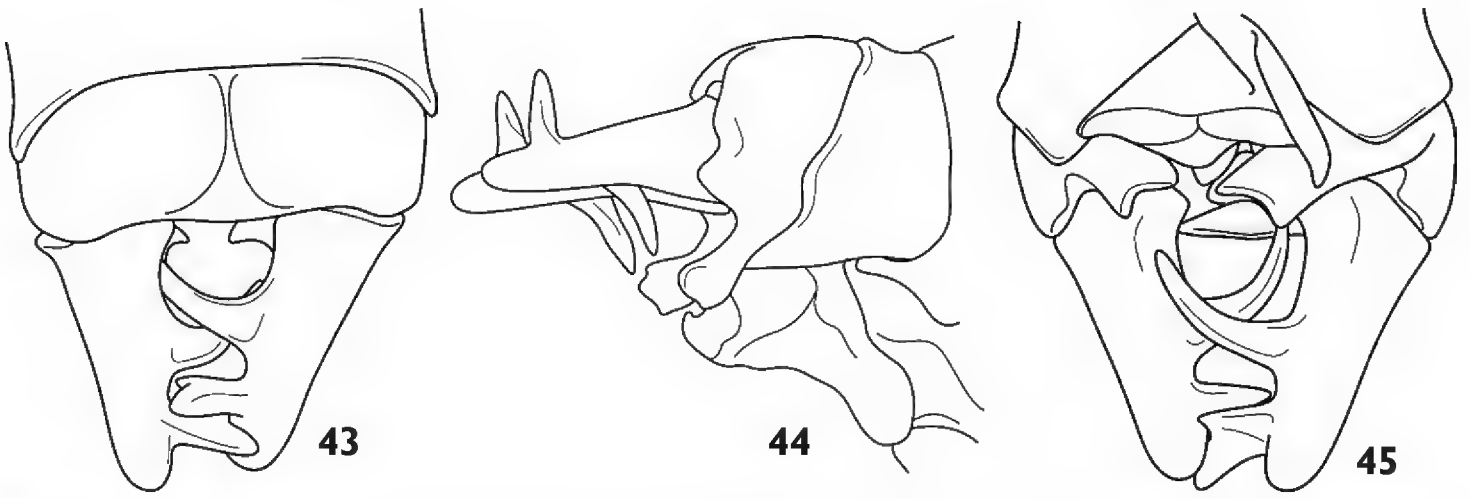
http://zoobank.org/C3EBFD67-A6E6-4B04-9A2D-243437D35BB6

Figs 42–45

Materials. Holotype♂, Vietnam, 40km S of Dilanh (Djiring), Alt. 543m, 1960.IV.26, coll. L.W. Quate (BPBM). Deposited in SEM temporarily.

Description. Male. Fastigium of vertex short, without dorsal groove, face slightly oblique (Fig. 42), compound eyes oval and protruded forwards and outwards, last segment of maxillary palpi slightly longer than preceding. The superior edge and inferior edge of pronotum paralleled and almost straight, paranota lower, front margin little sinuate, hind margin straight without humeral sinus and obliquely truncated; auditory foramina of thorax small and entirely exposed. Tegmina almost equal to pronotum, apex rounded; hind wings degenerate. Fore tibiae armed ventral spines of type 4, 4 (1, 1), lower lobe of the hind knee bearing a spine, hind tibiae with 28–31 dorsal teeth each





Figures 42–45. *Pseudothaumaspis bispinosus* sp. n. **42** head, pronotum and tegmina, lateral view **43** end of male abdomen, dorsal view **44** end of male abdomen, lateral view **45** end of male abdomen, ventral view.

margin above and 2 pairs of apical spurs. Hind margin of 10th abdominal tergite little sinuate (Fig. 43), lower part becoming a pair of elongate branches (Figs 44–45); cerci robust, generally conical and apex blunt, but each with 2 long inner processes: prior one downward, posterior one upward and little branched at apex. Subgenital plate damaged.

Female unknown.

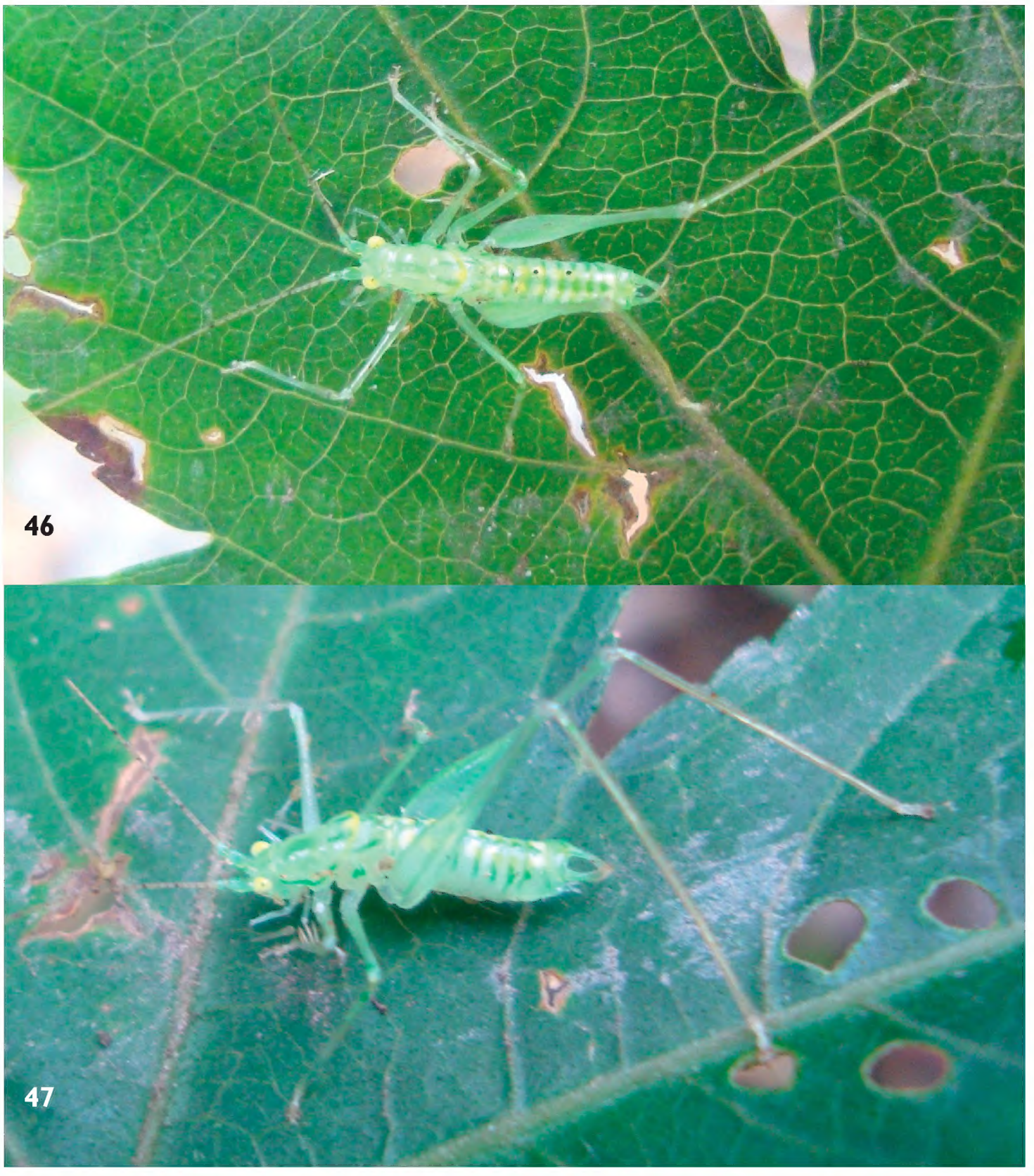
Coloration. Body yellowish (may be greenish alive), eyes blackish brown, antennae with inconspicuous darkish rings.

Measurement. (length in mm) Body, ♂12.0; pronotum, ♂3.8; tegmina, ♂4.0; hind femora, ♂12.0.

Discussion. This new species is similar to *Pseudothaumaspis gialaiensis* Gorochov, 1998, but differs mainly in the appearance of the male cerci. The single specimen of this species is in bad condition, especially the abdomen. Fortunately, the unique ventral arms of the 10th abdominal segment and the cerci are intact.

Etymology. The specific epithet refers to the character of male cerci which bearing 2 spinous processes, compose by prefix 'bi-' which means double and 'spinosus' which means spiny.

Distribution. Vietnam.



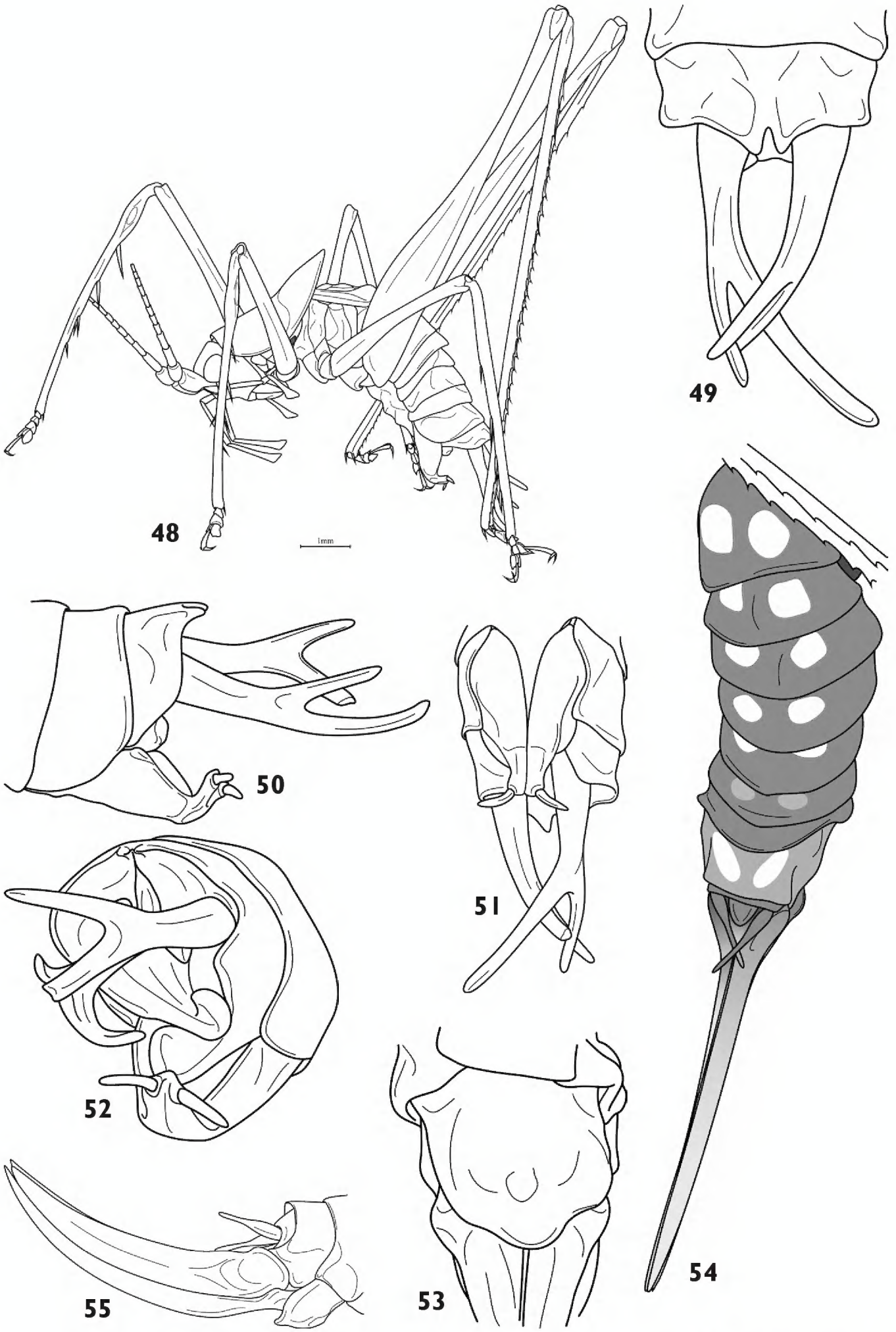
Figures 46–47. *Pseudothaumaspis furcocercus* sp. n., ecological photograph, lateral view and dorsal view.

12. *Pseudothaumaspis furcocercus* Wang & Liu, sp. n.

http://zoobank.org/31992FC9-40FC-4628-871E-2B60DC7E1464
Figs 46–55

Materials. Holotype♂ (# 14086640), China, Guangxi, Wuming, Damingshan, Alt. 1250m, 2013.VII.19–25, coll. W.B. Zhu, X.W. Liu, H.Q. Wang, H.G. Zhang. Paratype1♂ (# 14088762) 1♀ (# 14088763), same data as holotype (SEM).

Description. Male. Body form small and slender. Fastigium of vertex short, without dorsal groove, face slightly oblique (Fig. 48), compound eyes subglobular, last segment of



Figures 48–55. *Pseudothaumaspis furcocercus* sp. n. based on # 14086640 (**48–52**) and # 14088763 (**52–55**) **48** male body, lateral view **49** end of male abdomen, dorsal view (left cerci damaged at apex) **50** end of male abdomen, lateral view **51** end of male abdomen, ventral view **52** end of male abdomen, rear view **53** female subgenital plate, ventral view **54** female abdomen (2–11segments), dorsal view **55** ovipositor, lateral view.

maxillary palpi slightly longer than preceding. Pronotum saddle shaped in lateral view, paranota with concave dorsal margins, ventral margin rounded, humeral sinus absent, transverse sulcus distinct especially posterior one, metazona short, rather pointed at the posterior tip; auditory foramina of thorax small and exposed. Tegmina shoter than pronotum by one third, apex truncate; hind wings degenerate. Legs very long and rather thin (Fig. 46), fore tibiae with ventral spines armed 4, 4 (1, 1), lower lobe of the hind knee without spine, hind tibiae with 21–29 dorsal teeth either margin above and 2 pairs of apical spurs. Posterior median edge of 10th abdominal tergite elongate with a deep apical incision forming 2 small lobes (Fig. 49), lower area bearing a pair of ventral arms, not elongate and apex oblate (Fig. 52). Slim cerci branched at a half, incurved, lower branch longer. Subgenital base broad, apical one third narrow and up curved, styli very long (Figs 50–52).

Female. Body form similar to that of male. Fastigium of vertex little longer and more slender, a shallow furrow on the dorsum, last segment of maxillary palpi much longer than preceding. Paranota of pronotum subacute at inferior margin, transverse sulcus distinct as in male, but metazona even shorter. Tegmina short as in male, pointed at apex, inferior margin obliquely truncated, veins conspicuous. Posterior margin of 9th abdominal tergite straight, cercus slender, fusiform, apex thin and acute (Fig. 54); subgenital plate downward swell, trilobed at hind margin, mesolobe prominently convex. Ovipositor short, base upcurved, ventral valve without apical hook.

Coloration. In life of male. Body lightish green, emerald green and lightish yellow variegated. Flagella pale brown with darkish rings, scape and pedicel consistent with body color. Compound eyes vivid yellow. Both lateral rims of pronotum emerald green, but posterior edge vivid yellow, dorsum with green longitudinal stripes and patches. Each abdomen tergite with a pair of bright yellow oval patches and posterior edge darkish green. Hind tibiae, Tarsi and cerci terminal pale brown.

Dry specimen. Body brownish, antennae with inconspicuous darks rings, forma and tibia darkened around the knee joint. Male unicolor; female abdomen largely blackish brown, ventral surface totally black including subgenital plate, abdomen tergites each compact with a pair of large pale patches dorsally, base of ovipositor darkened.

Measurement. (length in mm) Body, ♂7.4–8.7, ♀10.2; pronotum, ♂3.2–3.6, ♀3.8; tegmina, ♂1.9, ♀1.5; hind femora, ♂8.3–8.9, ♀9.5; ovipositor, ♀4.5.

Etymology. The specific epithet from Latin 'forca' + 'cercus', corresponding the feature of male bifurcate cerci. The gender of the epithet is masculine.

Discussion. Bearing those unique arms, clearly it is a *Pseudothaumaspis*, but tegmina terminal, lower lobe of hind knee, small lobes of posterior edge of last abdominal tergite are quite different from previous species.

Distribution. China (Guangxi).

Acknowledgement

Great acknowledgement to JIN Xing-Bao for research notes and BI Wen-Xuan for providing specimen materials. This work was supported by the Natural Science Foundation of Shanghai, China (No. 14ZR1413000).

References

Beier M (1966) Tettigoniidae: Subfam. Meconematinae, Mecopodinae, Phyllophorinae. Orthopterorum Catalogus 9: 247–342.

Bey-Bienko GY (1957) Tettigonioidea (Orthoptera) of Yunnan (Results of Chinese-Soviet Zoological-botanical expeditions to south-western China 1955–1956). Entomologicheskoe Obozrenie 50(4): 827–848.

Bey-Bienko GY (1962) Results of the Chinese-Soviet zoological-botanical expeditions to south-western China 1955–1957. New or less-known Tettigonioidea (Orthoptera) from Szechuan and Yunan. Trudy Zoologitscheskogo Instituta, Akademiia Nauk SSSR 30: 110–138.

Bolívar I (1900) Les Orthopteres de St-Joseph's College a trichinopoly (Sud de I'Inde). Annales de la Société Entomologique de France 68: 761–812.

Eades DC, Otte D, Cigliano MM, Braun H (2013) Orthoptera Species File. Version 5.0/5.0. http://orthoptera.speciesfile.org/Common/basic/Taxa.aspx?TaxonNameID=1134789 [20 May 2013]

Caudell AN (1912) Orthoptera. Family Locustidae, Subfamilies Meconeminae, Phyllophorinae, Tympanophyllorinae, Phasgonurinae, Phasmodinae, Bradyporinae. Genera Insectorum 138: 1–25.

Gorochov AV (1993) A contribution to the knowledge of the tribe Meconematini (Orthoptera: Tettigoniidae). Zoosystematica Rossica 2(1): 63–92.

Gorochov AV (1998) New and little known Meconematinae of the tribes Meconematini and Phlugidini (Orthoptera: Tettigoniidae). Zoosystematica Rossica 7(1): 101–131.

Jin XB, Xia KL (1994) An Index-Catalogue of Chinese Tettigoniodea (Orthopteroidea: Grylloptera). Journal of Orthoptera Research 3: 15–41.

Karny HH (1924) VII. Prodromus der Malayischen Meconeminae. Treubia 5(1/3):105–136.

Kirby WF (1906) A Synonymic Catalogue of Orthoptera. 2, pt. 1, 562 pp.

Liu XW, Jin XB (1994) List of Chinese Stenopelmatoidea and Tettigonioidea (Grylloptera). Contributions from Shanghai Institute of Entomology 11: 99–118.

Liu XW, Zhou M, Bi WX (2010) Orthoptera: Tettigonoidea. In: Xu H (Ed.) Insects of Fengyangshan National Nature Reserve. China Forestry Publishing House, 68–91.

Otte D (1997) Orthoptera Species File 7: Tettigonioidea. The Orthopterist's Society at The Academy of Natural Sciences of Philadelphia. 97–98.

Redtenbacher J (1891) Monographie der Conocephaliden. Verh. der Zoologisch-Botanischen Gesellsch, Wien, 41, 315–562.

Wang HQ, Liu XW, Li K (2013) Revision of the genus *Neocyrtopsis* Liu & Zhang (Orthoptera: Tettigoniidae: Meconematinae). Zootaxa 3626(2): 279–287. doi: 10.11646/zootaxa.3626.2.5